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ABSTRACT

A limited analysis of alternative approaches to phonemic-level word attack instruction is provided in this document. The instruction segment begins with training in letter-sound correspondences for which mastery of certain skills is assumed. Instruction ends with the decoding of novel items having a consonant-vowel-consonant construction. Contents outlined consist of the following: preliminary assumptions, terms and definitions, associative training items, rules and hypotheses, instructional paths, and training-testing item universes. (JM)

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WORD ATTACK MODEL

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ABSTRACT

A quasi-formal model explicates a number of factors underlying investigation of effectiveness of alternative segmentation-blending rules in preliminary phonemic-level word attack instruction. Being taxonomic, the model does not predict; rather it reveals conditions to which segmentation-blending hypotheses of potential interest reference.

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WORD ATTACK MODEL

A limited analysis of alternative approaches to phonemic-level word attack instruction is provided below. The segment of instruction considered begins with training referenced to letter-sound correspondences; certain entry skills underlying this training are assumed. It ends with the child required to decode novel CVC items, thus revealing 1st-order generalization skill referenced to a segmentation-blending rule and appropriate training. The model is quasi-formal; it better reveals the conditions to which hypotheses reference than would a typical study proposal; however, it is less explicit and rigorous than a formal model would be.

1. Preliminary Assumptions

1.1 The instructional domain is that of preliminary phonemic-level word attack skills. The child enters instruction able to match written constructions of forms L, VC and CVC (grapheme, written vowel-consonant, written consonant-vowel-consonant) and also spoken constructions of forms /L/, /VC/, and /CVC/ (phoneme, spoken-blended vowel-consonant, spoken-blended consonant-vowel-consonant). While writing skill is not assumed the child on entry can achieve "written spellings" using Scrabblelike graphemic materials suitably arrayed.

1.2 Criterion response forms, of equal instructional value, are: a) Articulation-pronunciation of words and word elements presented to the child in written form. b) Construction of "written spellings" of words and word elements presented in spoken form.

1.3 Correct responses to instructional exemplars (0th-order generalizations based on associative instruction) are important and required; however, the larger objective of phonemic-level word attack instruction is to secure correct rule-based generalization of at least 1st order to novel items that are consonant with earlier instruction.

1.4 The system of letter-sound correspondences for English is many:1 (or 1:many). In time, the child will be required to deal with the many:1 characteristics of the system. However, the effectiveness of preliminary instruction will not be optimal unless the system is interpreted as 1:1 at the outset. (As with many important word attack issues, the literature is inconclusive regarding the assumption.)

1.5 Many of the "statements" of word attack instruction are non-generalizable statements because one term of the statement is specific rather than general.

1.51 Such statements as "c is a member of C" and "r is a member of C" are nongeneralizable unconditional statements, to be rote-learned in consequence of associative training. (The comprehension of such statements is required in that the child must demonstrate ability to classify a set of letters into consonant and vowel classes.)

1.52 Such statements as "r = /r/, or r/P = r/Q" assert that a specific term (r) realized as P (written) entails that term realized as Q (spoken) and vice versa. These are nongeneralizable conditional statements, to be rote-learned in consequence of associative training.

1.6 CVC = /C/+/VC/ = /CVC/ illustrates a segmentation-blending rule. Such rules are generalizable conditional statements because all terms are general or class terms. Such rules are taught by exemplarization—e.g., mid = /m/=/Id/ = /mId/, kid = /k/+/Id/ = /kId/. (Given a set of letter-sound consonant correspondences are learned along with their classification, then such items as bid, did, /lId/, /rId/ test for 1st-order generalization.)

1.7 Generalization referenced to the vowel class may occur; however, instruction will be most effective and efficient if only generalization referenced to the consonant class is solicited and evaluated.

2. Terms & Definitions

2.1 L_i denotes an ith member of the grapheme set--e.g., a, b, c. An ith member of the vowel subset of L is denoted V_i; of the consonant subset, C_i. $/L_i/$ is the phonemic equivalent of L_i; $/V_i/$ of V_i $/C_i/$ of C_i.

2.2 The symbol + between phonemes denotes segmentation. Thus, /V/+/C/ denotes a segmented vowel-consonant construction. Such a construction may represent a stimulus that entails response /VC/ or VC or a response to a stimulus /VC/ or VC. An equivalent construction at the CVC level is /C/+/V/+/C/.

2.3 When two phonemes are unseparated--e.g., /VC/--their proximity denotes blending. Such a construction may represent a stimulus that entails response /V/+/C/ or VC or a response to a stimulus /V/+/C/ or VC. An equivalent construction at the CVC level is /CVC/.

2.4 Constructions such as /C/+/VC/ are mixed.

2.5 The symbol = denotes a symmetrical relation; thus, $\underline{L_i} = /L_i/$ signifies both that $\underline{L_i}$ entails $/L_i/$ and vice versa. The same holds at VC and CVC levels, consonant with Assumption 1.2.

3. Associative Training Items

3.1 Nongeneralizable unconditional statements. For illustrative purposes, these will be taken as:

3.11 a ε V, 3.12 i ε V, 3.13 u ε V, 3.14 b ε C,
3.15 g ε C, 3.16 n ε C, 3.17 p ε C, 3.18 s ε C,
3.19 t ε C.

3.2 Nongeneralizable conditional statements.

3.21 $\underline{a}$ = /æ/, 3.22 $\underline{i}$ = /I/, 3.23 $\underline{u}$ = /ə/, 3.24 $\underline{b}$ = /b/,
3.25 $\underline{g}$ = /g/, 3.26 $\underline{n}$ = /n/, 3.27 $\underline{p}$ = /p/. 3.28 $\underline{s}$ = /s/,
3.29 $\underline{t}$ = /t/.

3.3 Consonant with Assumptions 1.2 and 1.5, these statements will be associatively trained and evaluated for 0th-order generalization. Instruction that follows is contingent upon the child's reaching near-perfect criterion performance referencing to the items of Content Statements 3.1 and 3.2.

4. Rules & Hypotheses

4.1 Rule: $\underline{VC}$ = /V/+/C/ = /VC/.

Hypothesis 4.11: If Rule 4.1 is exemplarized during training using the pair VC_i, VC_j (same V, different C), then the response to the novel item VC_k will reveal rule generalization; that is, the response will be correct.

Note: An incorrect response would indicate one of the following: a) Insufficient training trials referencing to the exemplars used. b) Gaps in prerequisite training. c) Inaptness of the rule as an expression of an effective word attack strategy. d) Inaptness of the training strategy on some other basis—e.g., number of exemplars used. e) Inaptness of the rule at the maturational level evaluated. f) A combination of these factors. Rejection of any such hypothesis that is, acceptance of the null version of the hypothesis—merely signifies the need for additional analysis and consequent reevaluation.

4.2 Rule: $\underline{CV}$ = /C/+/V/ = /CV/.

Hypothesis 4.21: If Rule 4.2 is exemplarized during training using the pair C_iV, C_jV (different C, same V), then the response to the novel item, C_kV will reveal generalization.

Note: While one can define CV constructions on short vowels for purposes of preliminary instruction, later morphophonemic-level word attack instruction usually will have the vowel long--$C\bar{V}$. Like the preliminary 1:1 assumption, preliminary instruction that defines CV constructions on short vowels signals a requirement for later repair work.

4.3 Rule: CVC = /C/+/VC/ = /CVC/.

Hypothesis 4.31: If Rule 4.3 is exemplarized during training using the pair C_iVC, C_jVC (different C_1, same VC_2), then the response to the novel item C_kVC will reveal rule generalization.

4.4 Rule: CVC = /CV/+/C/ = /CVC/.

Hypothesis 4.41: If Rule 4.4 is exemplarized during training using the pair CVC_i, CVC_j (same C_1V, different C_2), then the response to the novel item CVC_k will reveal rule generalization.

4.5 Hypotheses 4.12 and 4.22, featuring exemplarization consonant with vowel-referenced generalization, are alternatives to Hypotheses 4.11 and 4.21, featuring exemplarization consonant with consonant-referenced generalization. The alternatives 4.11-4.12 and 4.21-4.22 exemplarize tests of Assumption 1.7.

4.6 Hypotheses 4.31 and 4.41 reflect potential alternatives to segmentation-blending instruction at the CVC level, although the instructional strategies characterizing both hypotheses could turn out effective.

4.7 Rules and hypotheses can be extended to CCVC and CVCC constructions in consequence of a modest augmentation of the set of definitions: e.g., though addition of d = /d/, l = /l/, and r = /r/. Some rule alternatives at this level are:

4.71 CCVC = /CC/+/VC/ = /CCVC/.

4.72 CCVC = $/C_1/+/C_2VC/$ = /CCVC/.

4.73 CCVC = $/C_2/$ inserted at X of $/C_1+X+VC/$ = /CCVC/, where C_1VC is previously taught.

4.74 CVCC = /C/+/VCC/ = /CCVC/, where VCC = /VC/+/C/ = /VCC/.

4.75 CVCC = /CVC/+/C/ = /CVCC/, where CVC = /C/+/VC/ = /CVC/.

4.76 CVCC = /CV/+/CC/ = /CVCC/.

4.77 CCVC and CVCC constructions will not be considered further in this paper.

5. Instructional Paths

5.1 All possible instructional paths through phonemic-level instruction terminating at the CVC constructional level share the following components leading up to rule-referenced instruction: a) Entry skills reflected in Assumption 1.1. b) Classificatory skill referenced to the statements of Content Statement 3.1. c) Skill in responding to the lefthand or righthand term of the statements of Content Statement 3.2. Paths can diverge thereafter.

5.2 Alternative paths that may prove of interest are:

5.21 Training-testing consonant with H4.11, followed by training-testing consonant with H4.31 when criterion is met at the lower constructional level.

5.22 The same for the pair H4.21, H4.41.

5.23 Training-testing consonant with H4.11 and H4.21, followed by training-testing consonant with H4.31 when criterion is met at the lower constructional level.

5.24 The same for the triplet H4.11, H4.21, H4.41.

6. Training-Testing Item Universes

6.1 The foregoing descriptions of training conditions assume that two exemplars will be used to illustrate each application of each rule. Although perhaps not a first question for segmentation-blending investigations, it is conceivable that number of exemplars will interact with the different training strategies reflected in the diverging segments of the instructional path, sketched in Section 5. Based on the set of letter-sound correspondences presented in Content Statement 3.2, the following training-testing pairs of items are available. Training items appear above the line, testing items below.

6.2 VC Construction

ag ip ut

<u>an</u> <u>ig</u> <u>up</u>

ap	in	un
at	it	ug

6.3 CV Construction

ta	bi	gu
sa	pi	nu
ga	si	pu
na	gi	tu

6.4 C_iVC Construction

bag	nan	gap	pat	pig	bin
sag	tan	sap	nat	tig	sin
gag	ban	nap	sat	big	pin
nag	pan	tap	bat	sig	tin
nip	pit	tug	nun	sup	but
tip	sit	pug	bun	gup	sut
pip	bit	sug	pun	tup	nut
sip	nit	bug	gun	pup	gut

6.5 CVC_i Construction

nan	sat	pig	sin	sun	bup
nap	sag	pip	sit	sug	bug
nag	sap	pin	sig	sup	bun
nat	san	pit	sip	sut	but

6.6 The test items are for lst-order generalization. The exemplars themselves are test items for Oth-order generalization. Presence of two exemplars and two lst-order generalization test items permits Oth- and lst-order testing of the child once each for responses to spoken and written items for each rule application.

6.7 If one trains only certain of the rule applications reflected above, then the items of the nontrained rule applications can be used to test for 2nd-order generalization (see TM-1-71-2). This suggests one more question or possible interest: How many rule applications referenced to 1st-order generalization must occur before appreciable 2nd-order generalization is a consequence? The question probably is defective in that the answer may turn in part on certain characteristics of the child.